GENOTOXIC SUBSTANCES IN PRINTED PAPER AND BOARD FOOD CONTACT MATERIALS

A prioritisation strategy based on non-animal methods

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Printed paper and board

Widely & Frequently used

Major cause of contamination by FCM

Thousands of non (recently) safety-evaluated substances
Printed paper and board

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AIM:
PRIORITY ISATION STRATEGY
METHODOLOGY

Step 1: Database compilation
Step 2: *In silico* prediction
Step 3: Literature review
Step 4: *In vitro* testing

NON-ANIMAL METHODS
STEP 1: DATABASE COMPILATION

Van Bossuyt M, Van Hoeck E, Vanhaecke T, Rogiers V* & Mertens B* (2016)
Printed paper and board food contact materials as a potential source of food contamination.
\[ \sum = 6073 \]

- Evaluated: 77%
- Non-evaluated: 23%
- Single substances: #1723
- Other (polymers, mixtures, metals, etc.): 28%
STEP 2: *IN SILICO PREDICTION*

   *Food and Chemical Toxicology* 102: 109-119.

   *Toxicological Sciences* 163(2): 632-638

*Equal contribution*
Step 1: Toxtree
Step 2: VEGA
Step 3: Nexus
Step 4: Nexus

QUALITATIVE

QUANTITATIVE
Combination of gene mutation prediction results

- **Step 1**: Database
- **Step 2**: Computer
- **Step 3**: Books
- **Step 4**: Petri dish

**NO ALERT IN ANY TOOL**

- **POSITIVE IN 1**
  - #106
  - #128
  - #94
  - #204

- **POSITIVE IN 2**
  - #1191
Step 1: Sulphonic acid alkyl ester

Step 2: Aromatic nitro group

Step 3: Aromatic azo group

Step 4: Aromatic alkyl amino group

Step 5: Alkyl hydrazine

Step 6: Aziridinyl derivative

Step 7: Epoxide

Ashby-Tennant polycarcinogen
STEP 3: LITERATURE REVIEW

Van Bossuyt M, Van Hoeck E, Vanhaecke T, Rogiers V * & Mertens B*
_Prioritising substances of emerging concern for in-depth safety evaluation based on their genotoxic potential: the example of printed paper and board food contact materials._
Submitted to Toxicology Letters.
PRIORITY SUBSTANCES (#106)

Step 2

Official evaluation available

Genotoxic *in vivo*

Inconclusive

Not genotoxic *in vivo*

NO official evaluation available

Data collection from existing databases
Gene mutation data are lacking!
STEP 4: *IN VITRO TESTING*

*Van Bossuyt M, Van Hoeck E, Vanhaecke T, Rogiers V* & *Mertens B*

*Prioritising substances of emerging concern for in-depth safety evaluation based on their genotoxic potential: the example of printed paper and board food contact materials.*

*Submitted to Toxicology Letters.*
Gene mutation data are lacking!
Step 1: Exogenous metabolism system OR buffer
Step 2: Genetically modified Salmonella typhimurium
Step 3: Test substance
Step 4: Overlay agar

Suspension containing:
- Exogenous metabolism system OR buffer
- Genetically modified Salmonella typhimurium
- Test substance
- Overlay agar

Immediate plating
Minimal agar

Incubation at 37°C for 48-72 hours

Revertant colonies
Negative
Positive

Aromatic (di)azo

1. ≠ Metabolisation system
2. Additional cofactors
3. Pre-incubation 30'
Negative in NON-OFFICALLY VERIFIED gene mutation test
CONCLUSION

Step 1: Database compilation

Step 2: *In silico* prediction

Step 3: Literature review

Step 4: *In vitro* testing

#123

#106
Future perspectives

• For a full safety evaluation, **additional aspects** need to be investigated

  - **FCM-related**
    - Actual use
    - Type of food
    - Conditions of use
    - ...

  - **TOX-related**
    - Other genotoxic endpoint
    - Other toxicological endpoints
    - ...

• This prioritisation strategy can be extended to **other substance types/groups**
THANK YOU FOR YOUR ATTENTION!